DOCUMENT RESUME

ED 075 226 SE 015 912

TITLE	Guidelines for the Preparation of Teachers of Mathematics.
INSTITUTION	National Council of Teachers of Mathematics, Inc., Washington, D.C.
PUB DATE	[73]
NOTE	27p.
EDRS PRICE	MF-$0.65 HC-$3.29
DESCRIPTORS	Curriculum; Instruction; *Mathematics Education; *Objectives; *Preservice Education; *Teacher Education

ABSTRACT

These guidelines, prepared by a National Council of Teachers of Mathematics Commission, are intended to provide for general direction, generally expected levels of competence, possible evidence of the existence of essential characteristics, and indications of how the guidelines themselves help in the realization of goals. They are stated in terms of specific competencies but there was no attempt to describe precisely how these competencies might be measured. The scope of the guidelines is limited to the preparation of classroom teachers, age four through grade twelve. Areas covered include academic and professional knowledge in terms of mathematical content and in terms of understanding the contributions of humanistic and behavioral studies, professional competencies and attitudes, and the responsibilities of teacher education institutions. (DT)

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Guidelines for the Preparation of Teachers of Mathematics

These guidelines were developed by the commission to help responsible people--especially those people in colleges and universities that prepare teachers of mathematics--to find ways in which local teacher-preparation programs might be improved. A short form embodying the concepts in these guidelines was compiled for use in accreditation processes(such as NCATE) and is available from the NCTM.

As the name implies, "guidelines" are intended to be just that--they provide for general direction, generally expected levels of competence, possible evidences of the existence of essential characteristics, and indications of how the guidelines themselves help in the realization of goals. In preparing these guidelines, the commission examined guidelines prepared by CUPM, AAAS, AOTE, and other groups. These guidelines are not meant to contradict or conflict with those prepared by other groups; rather, they are designed to consolidate and expand on other sets of guidelines established for the preparation of mathematics teachers.

The guidelines themselves are not meant to be restrictive, and they should never be used to justify limiting any experimental procedures that might lead to the better education of teachers. Rather, they are

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These guidelines were prepared by the Commission on Preservice Teacher Education of the National Council of Teachers of Mathematics with extensive involvement of the NCTM membership and were officially accepted by the NCTM through the action of its Board of Directors.

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indicative of the best available information on the education of teachers and on what appear to be promising practices. Furthermore, they are not to be used to evaluate individual teachers. Individual guidelines generally are not of equal importance, nor does the order in which they are listed indicate relative importance. For example, there may be teachers who are highly successful, but their competencies may be combined in ways that prevent a one-to-one correspondence with the competencies set forth in these guidelines. The guidelines should not be used in such cases for determining the quality of a teacher's preparation. These guidelines are designed to help teacher-preparation institutions approach the job of preparing teachers to teach mathematics with more flexibility and with more emphasis on the quality of their teaching performance.

For the most part, these guidelines are stated in terms of specific competencies. There has been no serious attempt, however, to describe precisely how one might go about measuring these competencies. In some cases, that fact will be fairly obvious; in other cases, the measurement of the attainment of the competencies is not presently possible by any objective standards. Indeed, there is some reason to believe that those competencies that are of the greatest importance may be the most difficult to measure objectively. In light of this, individual faculty members and departments will have to make the best subjective measurements they can, but they should make serious efforts to be sure that the evaluations are as appropriate, fair, and objective as possible.

A special comment about three particular points seems appropriate. First, a knowledge of history is of great importance if mankind is to progress--anybody who is not aware of the mistakes and successes of the

past can fully expect to repeat many of the mistakes and relinquish many of the successes. Second, it is essential for teachers to know more than they are expected to teach and to be able to learn more than they already know, for without such knowledge, progress is essentially impossible (unless an entirely new teaching staff is to be employed every few years). Third, the teacher should have a realistic understanding of himself, his abilities, his values, and his attitudes toward working with children and youth, with other teachers, and with school personnel--he should be warm and accepting, yet objective, in working with others.

The scope of the guidelines is limited to the preparation of classroom teachers. They are not directly applicable to department chairmen, supervisors, elementary specialists, and others. The term preservice, as used here, is meant to be interpreted broadly to include all precertification professional activities of a prospective teacher, as well as including the first several years of full-time teaching. Indeed, the education and preparation of a teacher should continue throughout his career. Cooperation among schools, colleges, and certification agencies is desirable in preparing teachers up to, and beyond, the time of certification. Some states are using certification procedures that require a continual professional preparation for teachers during their entire career.

One further comment about the guidelines may be appropriate: they must be read in context. For example, if item 3 under "Reevaluation" on page 17 is viewed by itself, it appears to summarize the entire "Academic and Professional Knowledge" section below. However, taken in the context of the sentences associated with its own section, item 3 describes something that a beginning teacher should learn to evaluate.

To reiterate, these guidelines are not designed to be restrictive. They are offered with the hope that they will encourage competence and compassion in the teaching of mathematics and in the education of teachers of mathematics. If a particular program does not meet all the specifics of these guidelines but is innovative and encourages competence and compassion, then that program satisfies the essential spirit of these guidelines and will very likely also result in good mathematics education for the students.

Academic and Professional Knowledge

A prospective teacher of mathematics at any level should know and understand mathematics substantially beyond that which he may be expected to teach. He should be able to relate that mathematics to the world of his pupils, to the natural sciences, and to the social sciences. He should be aware of the role of mathematics in our culture.

The teacher should also possess a knowledge of the philosophical, historical, psychological, and sociological aspects of education.

Mathematical Content

Knowledge and Competency in Mathematics

Early childhood and primary grades

Teachers of early childhood and primary grades (ages four to eight) should be able--

1. to use and explain the base-ten numeration system;
2. to distinguish between rational (meaningful) counting and rote counting;

3. to perform the four basic operations with whole numbers and with positive rationals with appropriate speed and accuracy;
4. to explain, at appropriate levels, the mathematical reasons why operations are performed as they are;
5. to use equality, greater-than, and less-than relations correctly with their symbols;
6. to relate the number line to whole numbers and positive rational numbers;
7. to relate the number line to the concept of linear measure and describe and illustrate basic concepts of measuring such quantities as length, area, weight, volume, and time;
8. to extract concepts of two- and three-dimensional geometry from the real world of the child, to discuss the properties of simple geometric figures such as line, line segment, angle, triangle, quadrilateral, circle, perpendicular and parallel lines, pyramid, cube, and sphere, and to determine one-, two-, and three-dimensional measures of common figures;
9. to use a protractor, compass, and straightedge for simple figure drawing, constructing, and measuring;
10. to use the metric system of weights and measures and to estimate such measurements in metric units before actually measuring;
11. to create and interpret simple bar, picture, circle, and line graphs on two-dimensional coordinate systems and understand the effect of scale changes;
12. to use a calculator to help solve problems;
13. to use all the preceding competencies (1-12) to help create, recognize, and solve problems that are real to adults and

children ("solving problems" in this context includes ability to recognize problems that have no solution, ability to estimate the expected magnitude of the solution of a problem, and ability to recognize extraneous information in problems);

14. to discuss on an elementary level the history, philosophy, nature, and cultural significance of mathematics, both generally and specifically.

Upper elementary grades

Teachers of upper elementary and middle school grades (ages eight to twelve)--

1. should have all the competencies listed in the preceding section on the early childhood and primary grades, for such competencies will be needed for remedial work as well as for the understanding of some more advanced topics;
2. should be able to name and write large and small numbers and to create physical examples of approximations for such numbers (e.g., one million is approximately the number of minutes in two years and one billion is approximately the number of seconds in 32 years) and to distinguish between infinity and such numbers as a googolplex;
3. should be able to recognize and also to produce reasonable, consistent, and logical arguments (proofs) for elementary mathematical statements;
4. should be able to perform the four basic operations with positive and negative rational numbers using decimal notation and fractional notation and give a mathematical explanation at appropriate levels on why the operations are performed as they are;

5. should be able to recognize new algorithms or alternative methods for operations and be able to test the effectiveness and correctness of them;
6. should be able to solve practical problems in two- and three-dimensional geometry relating to congruence, parallel and perpendicular lines, similarity, symmetry, incidence, areas, volumes, circles, spheres, polygons, polyhedrons, and other geometric figures;
7. should be able to use the methods of probability and statistics to solve simple problems pertaining to measures of central tendency and to the dispersion, expectation, prediction, and reporting of data;
8. should be able to graph polynomial functions and relations and to make appropriate selection and use of such relations in the solution of practical problems;
9. should be able to write flow charts for simple mathematical operations and for other activities;
10. should be able to use quantitative skills to help recognize, create, and solve problems similar to those encountered by students at that level;
11. should be able to explain the concepts involved in measurement.

Junior high school

Teachers of junior high school mathematics (ages twelve to fourteen)--

1. should have all the competencies listed in the preceding section on upper elementary grades (for remedial work as well as for an understanding of more advanced work);

2. should be able to use appropriate mathematical procedures to solve problems relating to the physical, biological, and social sciences and to relate these processes to junior high school mathematics;
3. should be able to explain the differences and similarities between the rational and the real number systems at appropriate levels of sophistication;
4. should be able to use the methods of probability and statistics to solve reasonably difficult problems of inference and hypothesis testing;
5. should be able to use the methods of linear algebra to solve problems relating to the physical, biological, and social sciences;
6. should be able to relate the axioms, definitions, and theorems of abstract algebra to the number systems, algebra, and geometry found in secondary school mathematics curricula;
7. should be able to use the methods of number theory and algebra to discover and analyze new, "short cut," and standard algorithms, and other interesting properties of the systems found in school mathematics;
8. should be able to use at least one computer language (e.g., FORTRAN IV, COBOL, BASIC) to solve problems of appropriate level and complexity with the aid of a modern computer;
9. should be able to understand the language and procedures of at least one quantitative science (physics, chemistry, economics, biometrics) sufficiently well to be able to select

the appropriate mathematics needed to solve problems in that science in which the level of mathematics required is not above that of elementary calculus.

10. should be acquainted with library resources that can be used whet the mathematical appetities of pupils;
11. should be acquainted with the literature available to aid a teacher in organizing a mathematics club, books that are helpful for participants in a mathematics club, and types of activities that may make such a club successful.

Senior high school

Teachers of senior high school mathematics (ages fourteen to eighteen)--

1. should have all the competencies listed in the preceding section on junior high school (for remedial work as well as an understanding of more advanced work);
2. should be aware of various outside resources such as MAA lectureships, contests, local industries, and journals that might enrich the mathematical diet of high school students;
3. should have sufficient depth in analysis, abstract algebra, linear algebra, geometries, topology, probability and statistics, logic and foundations of mathematics, and computer science to be able--
   a) to understand, recognize, and create proofs in these branches of mathematics,
   b) to discuss with some degree of facility the structure of these branches of mathematics with some emphasis on the related axiom system and theorems and to relate these to elementary and secondary school mathematics,

c) to relate the given branch of mathematics to other aspects of mathematics and to other disciplines;

4. should have sufficient depth of understanding of at least one quantitative science so as to be able to build mathematical models and to solve problems (with quantitative as well as non-quantitative solutions) in that science which requires mathematics substantially above the level of elementary calculus.

Ability and Desire to Grow

1. Teachers of mathematics should be able to recognize the mathematical aspects of situations they have not studied previously. This requires a wide background in other disciplines so as to be able to relate these disciplines to mathematics.

2. Teachers of mathematics should be willing and able to formulate and solve, given a reasonable amount of time and effort, quantitative problems they have not studied previously.

3. Teachers of mathematics should be willing and able to learn mathematics that they have not previously studied with the aid of appropriate books or other materials and through discussion with their peers.

4. Teachers of mathematics should be able to evaluate their knowledge of, and competency in, mathematics in light of curricular requirements of courses they teach and of recommendations of professional groups, and they should be able to determine what further study (formal or informal) they need to increase their competence.

5. Teachers of mathematics should have sufficiently positive attitudes and good academic backgrounds to be able to learn appropriate further mathematics and to relate the advanced information to increasing their effectiveness as teachers.

6. Teachers of mathematics should have sufficient mathematical aptitude to give leadership successfully to the students they teach and to other teachers.

7. Teachers of mathematics should be able to relate the new mathematics they study and discover to the level of mathematics they are teaching.

Contributions of Humanistic and Behavioral Studies

Human development

Teachers of mathematics should understand human development and the nature of learning mathematics sufficiently well so that they are able--

1. to recognize how existing conditions are related to learning and how models for teaching use and change these existing conditions, to understand such models as concept attainment, inquiry training, laboratory, and group investigation, and to recognize under what conditions each is most effective;
2. to select and adapt strategies and materials that are consistent with professional knowledge about learning and are also appropriate for the special immediate situation (in relation to children, the content, the teacher, the environment, etc.);
3. to evaluate conditions, strategies, and materials used to teach mathematics;

4. to recognize stages of cognitive, affective, and psychomotor development in children and individual differences between children as these differences pertain to the learning of mathematics;
5. to diagnoze and prescribe remedies for common disabilities in the learning of mathematics and to know what tools and techniques are available to help with diagnosis and correction;
6. to identify the mathematically talented students and design learning activities to facilitate their mathematical growth;
7. to recognize developmental and behavioral problems that require special help the teacher cannot provide and to know what special help is available, how it can be obtained, and the teacher's role in referral cases;
8. to judge the significance of behavioral, educational, and mathematical studies for improving mathematics education;
9. to keep up to date on standard summaries of research in mathematics education and to be able to identify areas of research with their implications for the teacher's current teaching assignment or study;
10. to act as a leader in curriculum, textbook selection, evaluation, and professional group activities;
11. to use major theories of motivating children from different backgrounds to learn mathematics by showing its relevance to social situations, expressed personal needs, and children's future.

Cultural backgrounds

Teachers of mathematics should have sufficient knowledge of the variety of cultural backgrounds from which children in the schools originate in order to be sensitive to--

1. variables affecting the learning processes of children of different ages, races, ethnic backgrounds, languages, geographic origins, and living conditions;
2. positive and negative nonschool influences on the students' learning of mathematics;
3. the use of appropriate means to learn more about the backgrounds of specific children.

History of education and mathematics

Teachers of mathematics should have sufficient knowledge of the history of education and mathematics and of the institutions in one's society to be able--

1. to relate educational ideas and experiments of the present to those of the past;
2. to be aware of decisions made at the local, state, and federal level that may influence teachers' capacities to teach mathematics well and to determine the nature of that influence;
3. to plan and carry out means of influencing decisions that may affect mathematics education;
4. to show how these decisions have affected both mathematics and the total of society in order to make certain that students see the cause-and-effect relationships between mathematics and society.

Philosophies of teaching

Teachers of mathematics should be able to formulate their own philosophies of teaching mathematics and should be able--

1. to relate their philosophy to philosophies held by well-known educators and mathematics educators of the past and present (such as Piaget, Carl Rogers, Erik Erikson, John Dewey, E. H. Moore, D. E. Smith, Bruner, Gagné, Dienes, Beberman);
2. to draw inferences from their own philosophy that can be translated into specific learning and teaching activities in mathematics;
3. to evaluate results of practices inferred from their own philosophy and to establish systematic evaluation procedures for such evaluation and make appropriate adjustments;
4. to reevaluate and modify, if necessary, their philosophy in light of any new information or insight gained from any source.

Professional Competencies and Attitudes

The teacher should demonstrate positive attitudes towards mathematics, children, and teaching. He should have a realistic concept of his personal characteristics and be able to instill in others a realistic concept of themselves through his concern for them. He should demonstrate, through extensive work with children, an ability to encourage two-way communication with them concerning mathematics and related areas. The teacher should also demonstrate the ability to relate well to children of different interests and backgrounds. He should recognize individual differences and be able to prescribe appropriate activities to build on these differences.

He should use his academic and professional knowledge to improve his teaching. He should demonstrate the ability and desire to evaluate his own professional competencies. He should grow in his knowledge and teaching competencies as well as in his concern for others.

Teaching and Learning Theory with Laboratory and Clinical Experiences

The prospective teacher of mathematics should study the theories of teaching and learning concurrently with laboratory and clinical experiences, direct and simulated, so as to be able to relate theory and practice. This combined study and experience should begin as early as practicable (at least by the sophomore year) in the preparation of the teacher and continue throughout his career. This study and activity should integrate what the prospective teacher has learned about the mathematical, humanistic, and behavioral sciences. The teacher should be willing and able--

1. to discuss and evaluate the standard mathematics curricula and new curricular developments both for grade levels in which he may teach and for several grade levels earlier and later than those in which he is certified to teach;
2. to participate in curricular development and selection of materials for instruction;
3. to state long-range goals and specific objectives for teaching situations;
4. to consider and evaluate alternative means of achieving these goals and objectives;

5. to plan a program to achieve the desired objectives for children of different abilities and backgrounds. Such planning should take into account both mathematical and pedagogical considerations and the interactions between them;
6. to implement the program successfully, making use of his mathematical, professional, and personal competencies so that maximal desired results are realized;
7. to evaluate the progress of individual pupils and prescribe appropriate remedial and enrichment work for them in light of this evaluation;
8. to use various techniques (audio and video recordings, microteaching, interaction analysis instruments, peer and pupil comments, pupil success, supervisors' comments, etc.) to evaluate and improve his own teaching methods;
9. to develop measurement devices to supplement standard instruments and to measure those characteristics unique to particular programs;
10. to perform some simple educational experimentation designed to develop new procedures as well as evaluate the effectiveness of other people's recommendations for a particular situation;
11. to evaluate the entire program and form goals as a result of the evaluation procedures.

Practicum and Precertification Teaching

The practicum and precertification experiences should be a natural extension of laboratory and clinical experiences. They should be accompanied by continued study of all aspects of teaching mathematics. The practicum should provide a wide variety of alternatives such as teaching in inner-city, suburban, or rural schools, or schools in foreign countries, as well as open or highly structured schools. The teacher should demonstrate the ability to achieve the preceding eleven objectives with less outside supervision and motivation. The preparation and growth of a teacher should continue throughout his professional career, and he should demonstrate the ability and desire to grow. Such demonstration may occur through the following ways.

Reevaluation

A continual reevaluation by the teacher, using appropriate instruments, of his own philosophy and competencies should be made in order--

1. to relate effectively to his pupils and enhance their learning;
2. to be aware of recent developments in behavioral studies and relate them to his own teaching situations;
3. to increase his understanding of the mathematics that he is expected to teach and to be able to discuss its relation to society, the sciences, and the rest of mathematics at appropriate levels for students and parents;
4. to diagnose the variations in the learning abilities of each of his students and then prescribe for each student appropriate learning materials, laboratory experiences, sources of information,

sources of supporting help, and processes to be used to meet the student's needs in each section of mathematics;

5. to increase his understanding of the role, responsibilities, and services of other educational personnel, such as guidance counselors, department chairmen, supervisors, coordinators, and principals, as they relate to the student in the mathematics class and of the function of the mathematics teacher as a part of the total educational team, and to be aware of the potentials and pitfalls of differentiated staffing, team teaching, and other administrative techniques for grouping children for the improvement of instruction.

Programs

The teacher should plan and implement programs to strengthen his competencies. Such programs might include--

1. continued study in formal university course work in appropriate areas;
2. participation in informal study either in cooperation with colleagues or individually;
3. membership in appropriate professional associations (e.g., NCTM, MAA, AAAS, local and state mathematics education groups), including participation in their meetings and the study of their published materials;
4. visits with other teachers, usually of recognized excellence, and studying their methods with a view to evaluation and possible modification of his own;

5. carrying out of, or participation in, research projects to develop and evaluate new methods and programs;
6. dissemination through speeches or articles of those procedures he finds promising, of problems he believes need solutions, or of issues he believes need resolution.

Interest in future teachers

The teacher should exhibit a continued interest in improving the quality of future teachers of mathematics through encouraging promising students to enter teaching, helping with the preservice education of teachers, and so forth.

Institutional Responsibilities

All faculty members should have the knowledge, competencies, and attitudes described in the foregoing sections, entitled "Academic and Professional Knowledge"(p. 4) and "Professional Competencies and Attitudes" (p. 14). They should also have appropriate continuing experiences in schools. Appropriate resources in sufficient quantity should be readily available for use by the prospective teacher. Such resources should include a library with substantial holdings in mathematics, mathematics education, and educational foundations; audiovisual equipment (including video tape machines); mathematics materials in a laboratory setting; appropriate classroom space; and cooperative arrangements with a large number and variety of elementary and secondary schools to provide experiences for prospective teachers.

The institution should provide a wide variety of courses in mathematics to meet the needs outlined in the section on "Academic and

Professional Knowledge " A sufficiently strong program should be available so that the graduate can pursue further mathematical studies. All mathematics courses taught to the prospective elementary or secondary teacher should emphasize understanding the relation of mathematics to the development of the natural and social sciences and to our culture. These relationships should be easily identifiable with those confronting the students that the prospective teacher will be teaching.

Faculty

Although all faculty members in a teacher education institution (including cooperating teachers associated with practicum and pre-certification experiences) should have diverse backgrounds and styles of teaching, they should cooperate in the planning and executing of teacher-preparation programs. There should be an established system whereby all faculty members meet together regularly to continually plan and develop better programs.

Competence

1. Faculty members should have the requisite knowledge to teach their specialties. Degrees and formal course work may be an indication of such knowledge, but these are not sufficient to use as the sole criteria.

2. Faculty members should have had recent appropriate experience in schools.

3. Faculty members should teach in the manner that would be expected of the best graduates of the program. For example, a faculty member should regularly evaluate and improve his own competence, he

should use many strategies and materials, and he should give direction to students in classroom management.

4. Faculty members should be able to recognize and encourage creativity in their students.

5. Faculty members should be able and willing to counsel students effectively with regard to academic, personal, and vocational situations. Such counseling should encourage independence on the part of students.

6. Faculty members should remain intellectually alive through participation in professional organizations, through writing, through reading, and through similar activities that are appropriate to the professional specialities of the faculty member.

7. Faculty members should recognize the relationship that exists between the student's personal qualities and his academic abilities and be able to adjust to the diversities between students.

Utilization

1. Faculty members should be used to do those jobs for which experience and knowledge best prepare them.

2. Faculty members who have different specialities and backgrounds should be encouraged to cooperate with each other. For example, joint appointments should be encouraged when appropriate, and the joint planning of programs should be encouraged.

3. Every faculty member's load should include time to advise and counsel students.

4. Evaluation of, and the academic loads of, faculty members should be designed to encourage them to remain intellectually alive as a living model for students.

5. Specific needs of all levels of prospective teachers should be considered in curriculum development in the mathematics department as well as in the education department.

6. Some personnel in the mathematics department should be employed with consideration for their ability to contribute to mathematics instruction for teachers.

Prospective Students

Recruitment procedures should be instituted that will attract people with excellent minds who have an interest in the teaching profession and can relate and communicate well with other people, especially with children. Recruitment should not be, nor appear to be, discriminatory with regard to sex, race, social origins, age, or other nonpertinent factors.

Selection

The selection process should begin when the potential teacher of mathematics first expresses an interest in the profession and should continue at least through the attainment of permanent certification and tenure. Selection should be made on the basis--

1. of the interaction with children and adults in laboratory, clinical, practicum, and precertification teaching experiences--these experiences and evaluations of them should begin early, and the prospective teacher should demonstrate warm, friendly, empathetic, yet objective relations with children, peers, and other adults through all of his career, and those characteristics should be evident on each of his evaluations whether it is a self-evaluation or an external one;

2. of a knowledge of, and a positive attitude towards, mathematics and the ability to communicate that knowledge and attitude to others;
3. of a knowledge of humanistic and behavioral studies and the ability to use that knowledge to improve the teaching of mathematics;
4. of the ability to recognize and encourage mathematical creativity in pupils;
5. of the indication of ability and willingness to continue to grow in the capacity to teach mathematics as indicated by self-evaluation and self-education activities carried out and planned.

Counseling and placement

Each prospective teacher should be counseled regularly on his strengths and weaknesses by faculty who have some responsibility for the preparation of mathematics teacher, and he should be informed of the counselor's estimate of the likelihood of his becoming an excellent teacher. The prospective teacher should also be informed about the kinds of teaching situations in which his counselors believe he is likely to be able to make the greatest contribution, and the faculty should exert every effort to see that prospective teachers are placed in appropriate positions. Counseling should always be considered a cooperative venture in which students provide much of the data and insight. As a student progresses, he should become progressively less dependent on the counselor for resources and opinions.

Resources

1. Teacher-preparation institutions must have available schools of various types in which prospective teachers, professors, and inservice teachers can work cooperatively to prepare teachers of mathematics.

2. Teacher-preparation institutions must have available library holdings that will make possible further independent study by students and faculty in mathematics, mathematics education, and humanistic and behavioral studies. Such holdings should include appropriate periodicals and recent book titles.

3. Teacher-preparation institutions must have available (possibly through a local school) media and instructional materials appropriate for the teaching of mathematics (e.g., textbooks, tests, mathematics laboratory equipment, video tapes, films).

4. Teacher-preparation institutions and teachers working in the profession must seek out and develop schools where teachers in preparation can obtain appropriate experiences and teacher education practices can be tried and evaluated.

5. Teacher-preparation institutions must recognize that correspondingly greater resources of staff and material must be provided for the clinical and practicum components of the program than for other components.

Planning, Review, Evaluation

In planning, reviewing, and evaluating its programs to prepare teachers of mathematics, the faculty of a teacher education institution should--

1. seek the advice of all individuals interested in improving schools (including experienced teachers, administrators, university faculty members, students, and other citizens) but must retain responsibility for the ultimate decisions with the faculty;
2. include a broad liberal arts, humanities, and sciences background as well as mathematical and professional preparation;
3. develop performance criteria to evaluate the success of its programs but should recognize that there are important goals and behaviors that are not yet easily measurable by objective means and that must, therefore, be estimated using subjective processes;
4. recognize and encourage individual differences, thus creating programs sufficiently flexible to strengthen prospective teachers where they need strengthening and to give credit for strengths acquired previously;
5. recognize growth as a continuous process and plan programs that will encourage prospective teachers to act on this principle throughout their careers;
6. plan programs to evaluate the graduates of the teacher-preparation programs with a view to improving those programs through long-range planning based on continued evaluation.

GLOSSARY

In the guidelines, some terms have special meanings when used in the preparation of teachers. The glossary defines these terms.

Aptitude The ability to learn new concepts in a short period of time.

Certification The process by which a state department of public instruction authorizes an individual to teach particular subject areas in the schools of the state.

Certification agency Usually the state department of public instruction or a state commission.

Clinical experiences Work in public or private school teaching situations with students and materials under the supervision of local teachers and instructors from higher education.

Competencies An individual's expertise in all areas related to teaching, such as understanding students, knowledge of content, or abilities in the teaching process.

Enrichment That portion of the material not required but made available to students in order to enhance their interests, understanding, and appreciation of mathematics. This material also helps show the relationship of mathematics to the culture and other disciplines.

Evaluation The process of arriving at judgments, using available results of measurement.

Guidelines A set of general statements to provide assistance to the user in setting his directions, levels of competence, and expected results.

In-service Any time during which a person is teaching under full teacher certification.

Mathematics educator. A person whose profession is the study and practice of the professional mathematics preparation of teachers of mathematics.

Mathematics laboratory. An environment where mathematical inquiry takes place through mental and physical experimentation.

Pedagogical consideration. Pertaining to those things that affect the teaching process and that take into consideration the learning process of the student.

Performance criteria. Measures of behavior that enable one to determine if an individual carries out activities as one would expect him to do.

Practicum. Activities with students related to the teaching process directed and evaluated by some type of expert supervision.

Precertification. Any time prior to the receipt of a teaching certificate issued by the state agency.

Preservice. Any time prior to teaching under teacher certification for which there are no further requirements.

Professional groups. Groups of individuals who have formed organizations to work for the improvement of the teaching process.

Professional preparation. That protion of the teacher's preparation program dealing with the nature of the learner, the process of teaching, and the use of teaching materials.

Recruitment. The activity by which new members are encouraged to enter the teaching profession.